

## Upper Columbia River Basin

The Upper Columbia River Basin drains the north-central section of Washington between the Cascade Divide and the Spokane and Pend Oreille River Basins. The Upper Columbia is that portion of the river north of the Snake and Yakima Rivers. The basin totals 14,368,900 acres, of which only 288,100 acres represents water area. The area is largely brown, dry lowland which contrasts sharply with the distant mountains. Irrigation water, however, is steadily turning these near-deserts a productive green. The Columbia's principal tributaries in this region include the Sanpoil, Okanogan, Methow, Entiat, Chelan, Wenatchee, and Colville Rivers, and Crab Creek. There are numerous natural lakes, the largest being Lake Chelan, one of the deepest lakes in the United States. In addition, several man-made lakes have been created on the Columbia, offering excellent navigation and recreation opportunities. The climate in this basin is extremely variable. In the southern areas, the summers are warm, with temperatures of 80-95° F, while the highlands of the northern and western sections are generally cooler. Under the influence of arctic air masses, winters are cold, with extremes of -40° F. Great contrasts in precipitation totals occur within surprisingly short distances. In the westerly mountain areas, precipitation is more than 80 inches, with an annual snow cover of more than 100 inches being common. Eastward and southward, both snow depth and total precipitation decrease to a low of less than 10 inches annually.

## Chief Joseph Dam and Rufus Woods Lake

Completed Hydropower Project (Seattle District) Chief Joseph Dam is one of the principal projects in the federal government's program of comprehensive water resource development for the Pacific Northwest. The project, constructed for power generation, is located on the Columbia River near Bridgeport, 51 miles downstream from Grand Coulee Dam, at river mile 545. Completed in 1958, the dam is a concrete gravity structure 5,962 feet long overall and 236 feet high. The intake structure behind the powerhouse is 2,036 feet long and 150 feet high, with intake bays for 27 generating units. The original 16 units have a nameplate capacity of 88,000 kilowatts each. The powerhouse has been enlarged by 11 generators, each with a 95,000-kilowatt nameplate capacity. All of the new generators are producing power. In 1981, Rufus Woods Lake was raised 10 feet for the purpose of generating more power. Rehabilitation of the 16 original generating units was completed in January 1988. Powerplant capacity now approaches 2,614,070 kilowatts, making it one of the Corps' largest single power producers. The government's cost for constructing the 27-unit powerplant through September 1998 was \$540,676,321 including \$205,983 spent for recreation facilities. Operation and maintenance costs through September 1998 totaled \$195,766,208. Raising Rufus Woods Lake inundated 550 acres of shoreline vegetation and islands. To mitigate this loss, the Corps developed replacement wildlife habitat. Mitigation includes fencing, native shrubs, irrigation facilities, goose nesting islands, goose nesting structures, and raptor perches. The mitigation project was authorized by the Fish and Wildlife Coordination Act of 1958. The master plan to guide future use, development, and management of the project will be completed in fiscal year 1998. Major archeological studies have also been undertaken. This included a survey to identify and test sites and salvage excavation of several prehistoric habitation sites. Information recovered indicates extensive use of the project area over the past 6,000 years. The Colville Confederated Tribes cooperated extensively in efforts to ensure the preservation of resources relating to their heritage. Rufus Woods Lake extends almost 51 miles upstream to Grand Coulee Dam. It has a surface area of 8,000 acres. Road access to the lake is limited, except near the Chief Joseph dam and at the upstream end by Grand Coulee Dam. Bridgeport State Park, on the right bank of the lake, upstream from Chief Joseph Dam, includes 358 acres that have been developed by the Corps of Engineers. The park consists of 20 irrigated acres with trees and grass. An all-purpose recreation area has camping and picnic areas and comfort stations, a boat launch ramp, and a swimming beach. The park is leased to the Washington State Parks and Recreation Commission for Operation and Maintenance. The park expansion and upgrading, including increased day use and overnight camping facilities, were completed in 1987. The Washington State Parks and Recreation Commission has subleased land to a local group, Lake Woods Golf Club, where a nine-hole golf course is located along the lake. Overlook facilities have been constructed on the south bank off State Road 17 and on the north shore off Half-Sun Way. A visitor facility in the powerhouse was completed in 1988 and features a view of the interior of the powerhouse

and interpretive exhibits. A visitor orientation area is located on the north bank off State Road 17. A restroom facility was completed in 1991. For more information on Chief Joseph Dam and Rufus Woods Lake, click here

<http://www.nws.usace.army.mil/PublicMenu/Menu.cfm?site=cjd&page=mainpage>.

#### Chief Joseph Pool Raise Study

Reconnaissance Study (Seattle District) The Seattle District and the Colville Confederated Tribes, as the local sponsor, completed a reconnaissance study of raising the pool behind Chief Joseph Dam for the purpose of producing additional hydropower in 1992. The study was favorable and the Colvilles signed a Feasibility Cost Sharing Agreement to conduct more detailed studies. The feasibility study started in August 1994. Phase I of the multiphase feasibility study was completed in January 1997. Phase I was initiated to update the 1992 Reconnaissance Study and resolve trunnion status. Based on data and analyses, the trunnion anchorage loads exceed current design criteria and are a problem at both existing and proposed pool raise conditions. As a result, low and deteriorating benefit-to-cost ratio caused the project executive committee to terminate the project in November 1998.

#### Chief Joseph Dam Generating Units Beyond 27

Study Deferred (Seattle District) A detailed feasibility study was conducted as part of the Columbia River and Tributaries Comprehensive Study. The study evaluated the feasibility of installing generating units in addition to the present 27-unit powerhouse. The study was deferred in 1977 because of the lack of need for additional energy.

#### Columbia River - Wenatchee To Kettle Falls

Completed Navigation Project (Seattle District) Navigation of the Columbia River from Wenatchee to Bridgeport was improved in 1912 by removing rocks from the river and dredging a channel 3,300 feet long, 150 feet wide and 5 feet deep through Entiat Rapids. A rock-removal project completed in 1917 opened the river to navigation between Bridgeport and Kettle Falls. Construction of four dams without locks between Wenatchee and Kettle Falls has changed the channel from a straight-through waterway to five separate navigable reaches; from Wenatchee to Rocky Reach Dam, 8 miles; Rocky Reach Dam to Wells Dam, 44 miles; Wells Dam to Chief Joseph Dam, 30 miles; Chief Joseph to Grand Coulee Dam, 51 miles and Grand Coulee to Kettle Falls, 109 miles. Depths of these reaches vary with the operating elevations of the reservoirs. The total cost of the existing project as of September 1996 was \$274,391 for new work and \$7,693 for maintenance. The state of Washington also spent \$50,000 for this project.

#### Okanogan

Reconnaissance Report, Small Flood Control Project, Deferred Section 205 (Seattle District) In 1988 the city of Okanogan requested that the Corps of Engineers initiate a reconnaissance study of possible solutions to the flood control problems in the city of Okanogan. The last major flood on the Okanogan River was in 1972. This flood was estimated as an 80-year event. Three areas were investigated in the initial appraisal. Two of these areas justified additional investigation. A positive initial appraisal was completed in fiscal year 1988. A reconnaissance study conducted in fiscal year 1990 showed that the project was not economically feasible, and the study was terminated.

#### Okanogan River and Tributaries

Flood Control Study, Inactive (Seattle District) The Okanogan River drains 6,000 square miles of British Columbia and 2,400 square miles of north-central Washington. That portion of the river inside the United States lies entirely within Okanogan County, entering the Columbia River at Brewster. Similkameen River, the principal tributary, joins the Okanogan at Oroville. Flood control, irrigation, water supply, recreation enhancement, and maintenance and enhancement of fish and wildlife habitat are primary water resource problems. Many of those are considered international problems as large areas of the upper basin lie in Canada. Most lower valley lands and towns are prone to flood damage. Upstream storage on the Similkameen River would alleviate much of this flood damage along the Okanogan River,

and would allow power and irrigation development. Another possible measure would be an improved outlet structure to control Osoyoos Lake levels. Preliminary basin studies indicated the potential for local levee projects at Omak and Oroville, which were pursued under the Senate Flood Control Project Program. The study was deauthorized December 1987.

#### Similkameen River

Multi-purpose Interim Study, Deferred (Seattle District) An interim study was initiated in late fiscal year 1982 to determine the feasibility of a multiple-purpose project on the Similkameen River. The proposed project would include flood control, hydropower, and irrigation as project purposes. The study, sponsored by Okanogan County Public Utility District No. 1, Oroville/Tonasket Irrigation District and Okanogan County, was conducted under the Columbia River and Tributaries Study. The study was terminated in fiscal year 1989 because of lack of support from the study sponsors.

#### Omak

Completed Section 205 Small Flood Control Project (Seattle District) Approved in 1977, the levee project provides 14,000 lineal feet of levee and floodwalls on both banks of the Okanogan River in Omak. The levees provide protection from 100-year floods. Construction began in 1978 and was completed in 1979, with landscaping completed the following year. Federal expenditures totaled \$2,231,030. Flood damages prevented are not available.

#### Oroville

Completed Section 205 Small Flood Control Project (Seattle District) The levee project, approved in 1978, raised 6,999 lineal feet of levee about 2 feet and provided about 2,400 lineal feet of new levee along the Similkameen River. The levee provides protection from the 100-year flood. Construction began in 1979 and was completed in 1980, with landscaping completed the following year. Federal expenditures total \$1,787,630. Flood damages prevented are not available.

#### Wenatchee Canyons 1 and 2

Authorized Flood Control Project, Deferred (Seattle District) Debris-laden floodwaters from two canyons west of Wenatchee have historically caused heavy damage in northern Wenatchee and suburbs. A feasibility report recommended construction of reinforced concrete channels to carry runoff from both canyons through the city to the Columbia River. Congress authorized the project in December 1970. Federal project cost is estimated at \$24,440,000 (October 1977 price level). Expenditures for preconstruction planning were \$544,331. Advanced engineering and design studies were deferred pending local agreement to share in project costs. This project was deauthorized Jan. 1, 1990, under provisions of Public Law 99-662.

#### Esquatzel Coulee, Connell

Completed Flood Control Project (Walla Walla District) Connell, on the floor of Esquatzel Coulee, has been subject to periodic flooding by drainage from the Coulee. Channel deepening and widening, low levees and intermittent revetments along the Burlington Northern railway through Connell were authorized by the Chief of Engineers. Construction of these improvements was completed in January 1966 at a federal cost of \$293,000.

#### Middle Columbia Navigation Study, Columbia River

(formerly Hanford Canal Study) Multi-purpose Water Resource Study, Deferred (Seattle District) In 1969, the Seattle District prepared a survey study for a multipurpose Ben Franklin Dam at river mile 348, 10 miles upstream of Richland. The study was discontinued until funds were allocated in fiscal years 1979 and 1980 to resume investigations. The Corps published a report in September 1981 which addressed power, water and related land use, fishery resources, wildlife, threatened and endangered species, and other species of concern, prehistoric and historic cultural resources, nuclear facilities, ground water, and landsliding. In fiscal year 1983, the Corps initiated a study of the proposed Hanford Reach diversion

canal for navigation, hydropower, and fishery resource preservation and/or enhancement. In 1986, the Corps investigated the use of European styled barge lifts instead of locks. The barge lifts were shown to be less expensive than conventional locks. This interim study was conducted under authority of Columbia River and Tributaries. A technical report on the barge lift concept, developed for this study, has been prepared. The study was deferred in fiscal year 1989 due to lack of economic justification.

#### Jordan Creek

Pumped-Storage Study, Deferred (Seattle District) As part of the Columbia River and Tributaries Comprehensive Study, a detailed study was conducted to evaluate the Jordan Creek area as a possible site for a pumped-storage facility. The study showed that the project was feasible from an engineering and environmental standpoint. However, due to the reduction in development of large coal and nuclear powerplants, an available source of energy for pumping was not found. The study recommended that if an economic source of pumping energy is found, the study should be reactivated.

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